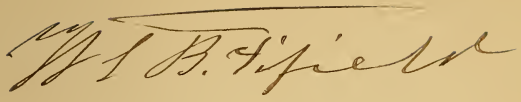

HYDROCELE

Nearly ready, by the same Author

DISEASES OF THE TESTICLE

HYDROCELE:

ITS

SEVERAL VARIETIES

AND

THEIR TREATMENT.

BY

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LONDON:

J. & A. CHURCHILL, NEW BURLINGTON STREET.

1878.

PREFACE AND DEDICATION.

Much that I have written is necessarily a repetition of what has been said before, but to make the subject complete I was compelled to combine the old maxims with the new ideas. A portion of the contents has previously appeared in Vols. V. and VII. of the *St. Thomas's Hospital Reports,* and the favourable mention which they received at the time suggested to me the idea of putting them together in one volume.

The drawings which illustrate these pages have been taken principally from the museum of St. Thomas's Hospital, not only because it is very rich in specimens illustrative of this subject, but also that reference may be made with greater ease.

In committing this work to the press I cannot do less than dedicate my labours to those to whom I owe all my medical knowledge—viz.,

the staff of St. Thomas's Hospital; but to one especially must I offer my most sincere thanks, for to Mr. Wagstaffe do I owe the great assistance which this work has received during its progress from his friendly criticism.

10, Maddox Street,
October, 1878.

CONTENTS.

ON HYDROCELE.

CHAPTER I.

ANATOMY OF HYDROCELES.

The development and anatomy of the parts, so far as they have reference to the several varieties of hydrocele, should be first described, thereby insuring as thorough a knowledge as possible of the normal conditions, before passing to the consideration of the abnormal.

The body of the testicle is first represented by an oval mass of whitish blastema, lying below and to the inner side of the kidney, and situated on the inner or concave surface of the Wolffian body. The excretory duct of the Wolffian body lies along its outer or convex edge; whilst on the anterior surface of the Wolffian body lies another excretory duct, having an upper bulbous extremity, and which is called the Müllerian duct.

The Wolffian body consists of numerous convoluted tubes, the lower and greater number of

which atrophy and disappear, the upper remaining to form the coni vasculosi in the male and the parovarium in the female, its excretory duct remaining as the vas deferens. A few scattered tubules, and probably their excretory channel, remain as the organ of Giraldès and vas aberrans.

The Müllerian duct atrophies in its central portion, leaving its upper extremity as the organ of Morgagni, and its lower part as one of the cornua of the uterus masculinus.

The testes, up to the age of five months of fœtal life, are situated at the back part of the peritoneal sac, a little below the kidneys, and are consequently invested by peritoneum on their anterior and lateral surfaces. At this time the testes commence to descend into the scrotum, the left preceding the right and pushing in front of them the peritoneal covering.

Prolongations of the peritoneal sac, called the vaginal processes, have previously been carried along the inguinal canal of either side into the scrotum, and into these prolongations the testis of the respective sides descends, still invested by peritoneum. At the end of the eighth month this movement downwards is completed, and the testes lie at the bottom and back part of pouches of peritoneum, which communicate above with the

peritoneal cavity. At about the ninth month the respective pouches usually become closed, the obliteration commencing at two points; at the upper inguinal opening, and just above the testis, the obliteration proceeds along the funicular portion of the vaginal process, until the two meeting, the whole is obliterated. As a result a sac is left of serous membrane below, enveloping the testis, and which is called the vaginal sac. When the testicle has assumed its ultimate destination in the scrotum, the organs of Giraldès, or the scattered remains of the Wolffian body, usually three in number, are tubular remains situated on the outer side of the spermatic cord, above the testicle, but within the tunica vaginalis. And the Müllerian duct, now retroverted from its former position, is represented at one end by the corpus Morgagni, situated between the globus major of the epididymis and the body of the testicle, and at the other by the opening at the sinus pocularis. Between these points the Müllerian duct is more or less obliterated, running downwards between the epididymis and the body of the testicle in the digital fossa, it turns upwards and enters into the formation of the numerous structures comprising the spermatic cord.

The tunica vaginalis, or vaginal sac, is the prolongation of peritoneum, which remains

patent after the obliteration of the funicular portion of the vaginal process. It consists of two portions, visceral and parietal. The outer, or parietal, forms the inner layer of the structures which comprise the scrotum; whilst the visceral portion is the inner part, which invests the viscus or testicle upon its anterior and lateral surfaces. The parietal or scrotal portion of the tunica vaginalis is more extensive than the visceral portion; and in addition to forming the inner layer of the scrotum, it extends upwards for about the space of three-quarters of an inch along the spermatic cord, covering it rather more on the inner than the outer side. It extends also slightly below the testicle, so that the testicle appears to be suspended at the back part of the vaginal sac. Posteriorly it becomes the visceral portion by being reflected along the back part of the epididymis. A small portion, however, is uncovered by the tunica vaginalis,—viz., that portion which corresponds to the point of entrance and exit of the blood-vessels and spermatic duct, and of attachment of the gubernaculum testis, a structure which is the chief aid to the testicular descent. The visceral or testicular portion of the tunica vaginalis envelops both the body of the testicle and the epididymis, connecting the two together, and on the outer

side is reflected into the pouch, which exists between them, and which is called the digital fossa. Below and on each side of the testicle the membrane becomes continuous with the parietal portion.

The structure of the vaginal sac resembles that of all serous cavities, and that of the peritoneum, of which it is an offshoot; and its objects are to provide the secretion of a certain amount of serous fluid, to allow of the free movement and alteration in size of the testicle, as well as to be a protection against external violence. Occasionally this serous sac form an exception to the general rule of serous membranes, being perfectly closed sacs, for the communication with the peritoneum in some cases remains patent even in adults, although the channel is narrowed from its original size. To speak of a serous cavity is a mistake, and misleading, in making one suppose the presence of a space between the visceral and parietal portions of the membrane; whereas the two are in health closely approximated, and the fluid secreted only sufficient to lubricate their contiguous surfaces, and to allow of their gliding easily the one over the other. An internal layer of tesselated epithelium, with a subjacent layer of fibrous tissue, comprises the structure of the vaginal sac, and this is connected

to the scrotal and testicular structures by a loose subserous areolar tissue. The serum, which is secreted, is a colourless and transparent fluid, which in constitution is identical with the serum of the blood from which it is derived.

The analogue of the vaginal process of peritoneum in the female is called the canal of Nuck, and gives passage to the round ligament of the uterus, which is the counterpart of the gubernaculum testis of the male. The round ligament contained in the canal of Nuck is attached to the front of the pubes, with the one of the opposite side at the mons veneris. The canal in the adult is occasionally found unobliterated. The Wolffian body becomes the parovarium and the scattered remains of Wolffian tubes, which in the male form the organs of Giraldès, in the female are represented by scattered tubular remains, situated in the broad ligament between the ovary and fimbriated end of Fallopian tube. One of these scattered tubes, enlarged and pendulous, forms a small cyst, or hydatid, which is usually found between the ovary and Fallopian tube, and which, becoming dilated, forms a variety of extra-ovarian cyst.

CHAPTER II.

CLASSIFICATION OF HYDROCELES.

The classification of hydroceles of the testis and cord, as at present given in text-books, tends somewhat to mislead.

Classification should be based upon some definite principle, and that which appears to me both most natural and most convenient is the anatomical; I would therefore adopt a simple classification, based, like that of hernia by Mr. Birkett, upon the anatomical development of the part, and from which the disease is a divergence. With such a classification the name applied to any particular variety of hydrocele should explain the variety spoken of.

Following out this idea I would enumerate the four following varieties :—

1st. Hydrocele of the tunica vaginalis, which may be either visceral or parietal (figs. 2, 3, 4).

2nd. Hydrocele of the whole vaginal process of peritoneum, which is necessarily congenital (fig. 5.)

Fig. 1. 

Normal condition.

Fig. 2. 

Hydrocele of the tunica vaginalis.

Fig. 3. 

Hour-glass shaped hydrocele of the tunica vaginalis.

Fig. 4. 

Bottle-shaped hydrocele of the tunica vaginalis.

Hydrocele of the whole vaginal process of peritoneum, which may be also more or less of hour-glass shape (congenital hydrocele of the testis).

Fig. 5.

Congenital form of hydrocele of the funicular portion of the vaginal process of peritoneum (congenital hydrocele of the cord).

Fig. 6.

Acquired form of hydrocele of the funicular portion of the vaginal process of peritoneum (hydrocele of the cord).

Fig. 7.

Bottle-shaped form of the same variety as fig. 7.

Fig. 8.

3rd. Hydrocele of the funicular portion of the vaginal process of peritoneum, which may be either congenital or acquired (figs. 6, 7, 8).

The acquired variety, varying in size, has unnecessarily received different names, according as to whether it be large or small. When large it has been called diffused, when small encysted; these names, when applied to only one variety, varying in size, it becomes difficult to say when one is large enough to be called diffused, and when small enough to be encysted, as the latter can become the former by the pressure of the serous fluid opening up the areolar tissue, which feebly unites the two surfaces of the formerly open funicular process of peritoneum.

4th. To this I would reserve the term encysted. It may be due to the dilatation of spaces in connective tissue, to the dilatation of the obliterated remains of the Müllerian duct, or of the organs of Giraldès, and to any other cysts occurring external to the tunica vaginalis testis.

The preceding diagrams in outline (after Bryant) represent the arrangement of the testicle and peritoneal prolongation in health and disease; and the names applied to the several varieties of hydrocele can thus be more easily understood by comparing the one with the other.

The thick black line represents the parietes of the scrotum, and the thin red line the peritoneum and vaginal sac; the small body at the bottom of the vaginal sac is the testicle.

CHAPTER III.

HYDROCELE OF THE TUNICA VAGINALIS.

Hydrocele of the tunica vaginalis signifies an undue collection of that serum which normally exists in the serous sac enveloping the testis, and which allows for any movement of the testicle, and keeps the two surfaces of the tunica vaginalis lubricated during the alterations in size, which necessarily take place during seminal secretion, as well as acting as a protection against external violence. The serous sac is formed by a prolongation of peritoneum, previous to the descent of the testis, which subsequently coming down posteriorly is suspended in the pouch, and becomes enveloped by it on nearly all sides. This tubular prolongation becoming finally closed from above downwards, a sac results at the lowest part.

As the lining of this sac envelops the testis on the one side, it may be described as consisting of visceral and parietal portions, the opposed surfaces of which are kept continually moist during health

by a continuous serous secretion; the fluid thus constantly secreted is as constantly reabsorbed into the circulation, and it is only when this finely adjusted balance becomes unequal that hydrocele results. The parietal portion forms a blind pouch above the testicle, and for about the space of three-quarters of an inch envelops the spermatic cord, covering it rather more on the inner than the outer side. Posteriorly it becomes the visceral portion by being reflected along the back part of the epididymis, a small portion of which remains uncovered where the vessels and duct enter or emerge.

The visceral portion envelops both the body of the testicle and the epididymis, and on the outer side is reflected into the small digital fossa which exists between them. Below the testicle, and on each side of it the membrane becomes continuous with the parietal portion.

In connexion with the visceral portion, a fact of great importance should be mentioned, for which we are indebted to M. Gendrin, who at page 64 of his work, "Histoire Anatomique des Inflammations," uses these words:—

"The constant participation of the subserous cellular tissue with the inflammation of serous membranes, can be explained by the fact that the inflammation extends itself to the parts

which it covers, and reciprocally; it also affords a reason for the limits that these inflammations meet with in their propagation. This proposition seems paradoxical, but it is nevertheless the consequence of facts.

"When the subserous cellular tissue extends into the contiguous organ, and penetrates into its thickness, one perceives that it becomes the means of communicating the inflammation; whilst the propagation of the inflammation will not take place, however, when the contiguous organ shall be of different texture to that of the cellular tissue, or when this tissue shall be very different in the texture which it furnishes to the organ." Which, applied to the tunica vaginalis as to other serous membranes, means that where in connexion with the epididymis the subserous cellular tissue penetrates and becomes continuous with that, binding together the constituents of the epididymis, it readily becomes the means of communicating inflammation to the epididymis itself; but where in connexion with the tunica albuginea, which covers the body of the testicle, and not the epididymis, inflammation by contiguity does not take place. But, at the same time, to suppose that no areolar tissue exists between the body of the testicle and the tunica vaginalis is a mistake, as the base line of all

serous tissues will show, that although small in comparison to that separating the epididymis, it is nevertheless sufficient to be easily affected by inflammation, whether it be from without or within. It is not the presence or absence of areolar tissue that limits the extension inwards of the inflammation to the body of the testicle, but the unyielding structure of the tunica albuginea, which resists inflammation from without. However, when the tunica albuginea is affected with inflammation, it is as liable to transmit it to the tunica vaginalis, through the subserous cellular tissue, as the epididymis is; also the penetration of the areolar tissue among the interstices of the epididymis, making it the means of more ready communication of inflammation when the tunica vaginalis is primarily affected. Evidence in proof of this is frequently seen in disease.

The hydrocele in syphilitic orchitis is the result of the extension of the inflammation from the fibrous tissue, the tunica albuginea, to the adjacent tunica vaginalis; so, also, the hydrocele in gonorrhœal epididymitis is the result of the extension of the inflammation from the semi-muscular canal of the epididymis, both being examples of visceral hydrocele, or hydrocele produced by inflammation, extending from the body

of the testicle in the one case and from the epididymis in the other to the tunica vaginalis.

On the other hand, the susceptibility of the epididymis to become indurated, as a secondary consequence to inflammation of the tunica vaginalis, led M. Panas, in the "Archives Gén. de Méd.," to believe that simple hydrocele was always caused by a partial epididymitis; and orchitis, as the secondary consequence of an inflamed tunica vaginalis, does not take place, for reasons previously mentioned. The sac of the hydrocele is usually thin, but in old and chronic cases it becomes thick, and, as the result of inflammation, lined by a red velvety false membrane, with occasional membranous bands and septa passing from one side to the other, thus accounting in some cases for the want of translucency.

Having described the serous sac itself, it remains to speak of its contents. Excessive accumulation of serum may be due to excessive secretion, passive exudation, or to defective absorption, originating from some cause which in its origin may be either inflammatory or non-inflammatory, and the hydrocelic fluid must consequently vary in its chemical composition. If inflammatory the serum will contain fibrine in solution; if merely dropsical the liquid is merely

serous, and of a specific gravity of 1024 to 1028; the fluid varies in character from that of the serum of the blood to one containing more or less fibrine, and frequently some cholesterine, especially in old and chronic cases. An analysis quoted by Mr. Curling gives—

Water	91·25
Albumen	6·85
Uncoagulable matter	1·1
Salts	·8
	100·000

The colour varies from a straw- and lemon-yellow to amber and yellowish-red, which may be clear or more or less opalescent, the turbidity varying according to the amount of fatty molecules it may contain. The reddish colour which is sometimes imparted to the fluid is due to a slight admixture of blood, and the opalescent appearance to crystals of cholesterine. As much as six quarts have at one time been extracted from a hydrocele—viz., that of the historian Gibbon, by Mr. Cline, quoted in Sir A. Cooper's work "On the Structure and Diseases of the Testis," page 251. The average quantity, however, is about six ounces.

Passing now to the varieties of hydrocele of the tunica vaginalis, I would divide them into

two—viz., visceral and parietal. This division I consider of great importance, as the prefix of either of these words at once signifies the origin of the hydrocele, and also gives a clue to the line of treatment to be adopted. A hydrocele which is visceral in its origin requires the treatment of the original cause, and not of the hydrocele itself, which is only secondary, just in the same way as a dropsy of the extremities is often secondary to disease elsewhere, say of the kidneys, heart, liver, &c., in which case the original cause, and not the consequence, has to be the subject of treatment.

Without entering into the question whether tapping is justifiable in gonorrheal epididymitis associated with hydrocele, I would say broadly that when hydrocele is secondary to another disease the treatment of the hydrocele must and ought to be subsidiary to the treatment of the original complaint. I consider tapping in visceral hydrocele following epididymitis is as unjustifiable as it is in hydrocele following syphilitic orchitis.

Of visceral hydrocele the following are examples—that following epididymitis, that following syphilitic orchitis, and that following cancerous enlargements of the testicle or other forms of hydro-sarcocele; in these cases the visceral layer of the tunica vaginalis becomes affected by con-

tact with the inflammation of the epididymis or the body of the testicle, as the case may be, and as a result effusion takes place into the tunica vaginalis.

Of parietal hydrocele it is more difficult to get a simple example, as the visceral portion is probably also at the same time affected, or will soon become so by the continuity of inflammation; but in this form the body of the testicle will never present any sign of disease, nor will the epididymis, except secondarily, as the result of means used to effect the cure of the disease by inflammatory action.

The following effects caused by a blow afford a good example of this variety, and show one of the chief uses of the serous sac of the tunica vaginalis in acting as a buffer to withstand external violence, which might be applied to the extremely sensitive organ the testicle.

It occurred in a young man hit by a cricket ball, who suffered no pain and had no enlarge ment of his testicle, but hydrocele resulted in consequence.

I believe a blow upon the scrotum will produce parietal hydrocele, whilst a blow in excess of the expenditure of force required to cause hydrocele will produce orchitis.

Here as the result of the blow an excessive

secretion of serum takes place, which distends the sac of the tunica vaginalis, and one of the forms of traumatic hydrocele is produced.

Traumatic hydrocele may also occur from a secondary inflammation of the tunica vaginalis following orchitis. Therefore traumatic hydrocele occurs on the side upon which the injury is received, and differs from idiopathic hydrocele, which is most frequently met with on the left side.

Parietal hydrocele may be also caused by the irritation of loose cartilaginous bodies consequent upon the rupture of the peduncle of the hydatid of Morgagni.

Perhaps the best example of parietal hydrocele is that occurring in old people, which is chiefly caused by passive exudation, resulting from the pendulous condition of the scrotum, and due to the relaxation of the capillaries of the tunica vaginalis consequent upon the general arterial relaxation of old people, whereas hydrocele of the tunica vaginalis in young adults, except arising from injury, is essentially of the visceral form.

Hydrocele of the tunica vaginalis may occur on either or both sides, the relative frequency of the two sides being according to Curling in favour of the right side; but I am inclined to

agree with Bryant, Velpeau, Gerdy, and Dujat, in believing the left side to be that most frequently affected, as during the time of my registration of cases at St. Thomas's Hospital I carefully collected the notes of some years, which show a little in excess of one-half to be on the left side, one quarter on the right, and a little below one quarter double. The numbers are thirty-one on the left side, fourteen on the right, and eleven double.

In these statistics I have been careful to exclude all cases of traumatic hydrocele, and believe that if all authors classified only idiopathic hydrocele their statistics would also show a preponderance in favour of the left side.

The greater frequency of the left side is, I believe, due to the greater dependency of the left testis and the mode of exit of the blood into the renal vein, producing venous congestion and subsequently excessive transudation of serum. The question why the left testicle hangs lower than the other has never received a satisfactory solution. That it is the first to enter the scrotum is possibly the reason it is ultimately situated the lower, but why it should enter first is not accounted for by the fact that it has the longest way to travel, but possibly to the fact that in the process of the development of the great

bloodvessels and the obliteration of the arches on the right side, the left becomes more fully supplied with blood and therefore precedes the right in its developmental activity.

Anyhow the chief cause of hydrocele is undoubtedly venous congestion determined by hepatic or renal enlargements, or any obstruction to the outflow of blood, not omitting inguinal hernia, which Mr. Curling observes to be "a disease obviously very favourable to the effusion of serum in the tunica vaginalis, owing to the pressure of the rupture on the veins of the spermatic cord, and which is often increased by the use of trusses and bandages."

Its greater frequency amongst inhabitants of warm climates, especially of the West Indies, is probably due to venous congestion arising from hepatic enlargements, which we know to be so common amongst those inhabitants.

Hydrocele of the tunica vaginalis is most frequently met with in middle-aged persons between the ages of forty and fifty; occasionally, however, in infants, but probably in these cases they are truly hydroceles of the vaginal process of peritoneum, there still remaining some patency of the opening into the peritoneal cavity, as the opening in the funicular portion may be small enough to allow of fluid percolating drop by drop into the

tunica vaginalis, but yet not large enough to allow of its being returnable into the peritoneal cavity, the diagnostic symptom of hydrocele of the vaginal process of peritoneum. Amongst old people the disease is as prevalent as amongst the middle-aged, for the proportion of old people living affected with hydrocele is as great as the proportion of middle-aged people affected with the same.

As to the effect of hydrocele upon the functions of the testicle, it seems a large hydrocele is likely to cause the suppression of the spermatic function on the side upon which it is situated, from the long-continued pressure of the fluid and by the stretching of the epididymis from the body of the testicle; therefore double hydrocele, under certain conditions, should be enumerated as one of the causes of sterility in the male. These remarks apply only if the disease has been allowed to continue for any length of time, and therefore afford a great reason for early treatment. A paper on this subject was communicated by M. Lannelongue to the Société de Chirurgie, July 16th, 1873, and reported in "L'Union Médicale." The author there states that in large hydroceles no spermatozoa were found either in the epididymis or vesiculæ seminalis; whereas small hydroceles do not lead to complete suppression of

spermatozoids, but the animalcules are modified and altered in the seminal passage. He therefore considers that early treatment is called for in cases of hydrocele in order to prevent the weakening and abolition of the spermatic functions.

Hydrocele in the female, or a collection of serum in the lower part of the canal of Nuck, the analogue of the vaginal process of peritoneum in the male, is occasionally met with; of such I have been fortunate enough to see an example, and as the rarity of these cases is great the notes are here subjoined.

"E. D——, aged forty-five, married, with two children, was admitted into the hospital on May 29th, under Mr. Wagstaffe. She first noticed a lump on the left side in the position of the inguinal canal about nine years ago, and which in size was about that of a gooseberry. She was in the habit of pushing it up, but it seldom remained so, and she finally wore a truss, believing it to be a rupture; it always remained up when lying down.

"The tumour had grown much larger the last two years, principally, she thought, through having to do a good deal of standing about, and on admission was the size of three walnuts, very tense, not painful, evidently with fluid contents,

not returnable into the abdomen, with no sickness or abdominal tenderness.

"The left hip-joint had been dislocated since childhood and anchylosed.

"30th.—Chloroform given and cyst punctured with fine trocar and about three ounces of reddish-yellow fluid withdrawn. Four days afterwards cyst was found to be refilling, and on June 10th the cyst was retapped, and after about two ounces had been withdrawn, one drachm of tinct. iodini was injected.

"The cyst subsequently refilled, but finally diminished, and she was presented cured on June 24th."

The absence of pain and impulse on coughing, with no disturbance of digestion, and the elongated form of the swelling, extending along the inguinal canal, and transparency, are the means of diagnosis from hernia.

The diagnosis of a hydrocele may be considered under the following headings:—Scrotal swelling, fluctuation, transparency, testicular sensation.

The presence of a scrotal swelling which on examination is found to be internal to the testicular coverings and external to the testicle (the testicle being in no way implicated, and in addition

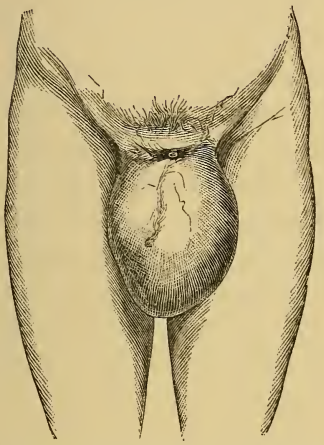
placed posteriorly and to the upper part of the swelling) points to a collection of fluid in connexion with the tunica vaginalis which can be only one of two things, hydrocele or hæmatocele, and which, if translucent, can be definitely affirmed to be the former, but if opaque the diagnosis is one of extreme difficulty and can only be decided by the trocar.

For hydrocele and hæmatocele may both have in common the following symptoms—want of translucency, fluctuation, testicular sensation, sudden appearance, and history of injury; so in forming an opinion it behoves one to speak with great caution, for the shades of gradation from hæmatocele to a hydrocele containing a certain amount of blood are so gradual that any one speaking positively will frequently find himself in error. Especially is this likely to occur in cases of hæmatocele following hydrocele, but the sudden appearance of the swelling, history of injury with ecchymosis of the scrotum, and solidity, are points in favour of its being hæmatocele. An amendment should also be made as to the position of the testicle being always posterior; it is rarely found anterior, and when this occurs it must be accounted for by some abnormality in the descent of the testis at birth; but not unfrequently the testis is irregularly placed,

owing to adhesions taking place between the two layers of the tunica vaginalis.

The size of this scrotal swelling will vary from that of a hen's egg to one of such magnitude that the penis is completely buried and merely represented by a button-like aperture, and is

FIG. 9.



Showing penis completely buried by hydrocele of left side.

annoying to the patient in not only preventing the proper functions of the organ, but also, on account of size, cumbersomeness, and inability of secreting it, and although no actual pain is occasioned, a feeling of weight and a dragging sensation along the cord is experienced.

Pain is occasionally met with in cases of reaccumulation of fluid after tapping. Its shape is oval in recent cases, pear-shaped in old ones, owing to the patency or the pressure of the hydrocelic fluid opening up the funicular portion of the tunica vaginalis. It not infrequently presents an hour-glass shape, owing to the natural contraction of the tunica vaginalis above the testicle, or to the presence of a hydrocele of the funicular portion of the vaginal process opening into a hydrocele of the tunica vaginalis. The shape is, moreover, often irregular, owing to the adhesion of the visceral and parietal portions of the tunica vaginalis together, "the outline of a hydrocele depending upon the anatomical conditions of the part in which it is situated and the pathological changes which may have resulted from the affection."

Fluctuation detected by palpation is a very important symptom in the diagnosis of hydrocele.

Translucency is, however, the chief aid to a correct diagnosis, although it cannot be solely relied upon, for transparency is at once indicative of some form of hydrocele, and should any malposition of the testicle be present this is at the same time seen and remembered in the course of treatment. Complete translucency is

spoken of by some French writers, but such a phenomenon is impossible unless in a case of undescended testicle.

Transparency is conclusive evidence in favour of one of the forms of hydrocele; but, on the other hand, its absence does not militate against its being a hydrocele, as an opaque fluid or a thick-walled sac will falsify the result; the wall of the sac being in some instances of almost cartilaginous consistence, and occasionally the seat of earthy deposits; the greater the age of the patient, the greater likelihood of alteration in the structure of the sac wall. The best means for detecting transparency is by using a stethoscope applied firmly to the scrotum on the one side, the integument of which is tightly stretched by the left hand placed posteriorly, whilst a lighted candle is closely applied on the opposite side; the hand is frequently used as a tube, but imperfectly so, as rays of light cannot fail to pass between the fingers and render the transmission of light imperfect. Testicular sensation is that peculiar sickly feeling which results from squeezing a healthy testicle, and is always to be found in parietal hydrocele, but is frequently absent in visceral hydrocele, that is, when the hydrocele is secondary to some form of orchitis. On manipulating a hydrocele this

should, if possible, be determined, as marking the position of the testicle will prevent any injury thereto in a subsequent tapping.

That hydrocele of the tunica vaginalis should ever be mistaken for hernia seems improbable, but from the numerous cases which come under my notice at the Surgical Appliance Society in Great Ormond Street, proves that such is frequently the case; but a hernia giving an impulse on coughing, with opacity and probable reducibility, with the swelling terminating below the external ring, are symptoms sufficiently diagnostic to prevent any error.

The external appearances of a hydrocele of the tunica vaginalis are usually very characteristic. The swelling is one of the scrotum, and does not involve the groin, and when the upper part of the scrotum is taken between the finger and thumb, the swelling is found to be below and the cord free. Also the central line which indicates the scrotal septum is pushed over to the opposite side, as represented in Fig. 9. The history of the case will probably be that the swelling commenced gradually and was largest below, and as it increased in size the swelling extended upwards.

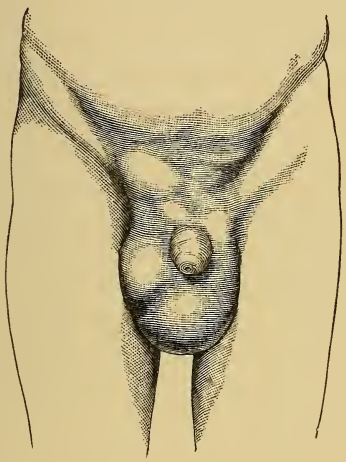
This swelling, which is usually pyriform in shape, cannot be returned into the abdomen, has

no impulse imparted to it on coughing, fluctuates, and is translucent by transmitted light.

Translucency is, as previously mentioned, occasionally absent, either from a thick-walled sac or an opaque fluid.

In Fig. 10 the free space on the right side

FIG. 10.



Representing a hydrocele of the left side, and a hernia or bubonocele on the right.

between the testicle and the hernia, showed that it was not a hydrocele of the tunica vaginalis, and the upper swelling, being reducible with a distinct gurgling sensation, showed it to be a hernia; whereas on the left side the

testicle was obscured by the swelling, the cord was found free at the upper part of the scrotum, and the swelling did not involve the groin.

The cure of a hydrocele is effected in one of two ways, either by the simple withdrawal of the excess of serum, with or without the injection of mild styptics, whereby a fresh and healthy action is imparted to the tunica vaginalis and secretion and absorption are carried on reciprocally (see St. Thomas's Museum Prep. E. E., 74); or by the deposition of lymph with the complete (Prep. E. E., 76), or without any (Prep. E. E., 78), obliteration of the sac, effected either by the injection of strong styptics, whereby inflammation is set up, and the visceral and parietal layers of the tunica vaginalis become thickened with adherent lymph, or more or less approximated by adhesions taking place between them, or by allowing the sac to suppurate and granulate up from the bottom.

Before commencing a description of the several modes adopted for attaining either of the above ends, it should be borne in mind that, according as constitutions vary in their degrees of stability, so in the same ratio will the effects of inflammation vary in those same constitutions; I propose, therefore, to consider the modes of treatment *seriatim*, taking the milder measures first,

and I would lay down as a general rule of treatment that it is not advisable to resort to severe measures to attain a result when milder ones will answer the same purpose.

In children the application of the ordinary evaporating lotions sometimes succeeds in effecting a cure, probably due materially to the good feeding or tonic treatment with rest resorted to at the same time; spontaneous disappearance is not uncommon in children, and has been spoken of in connexion with adults. I have never been so fortunate as to have seen an example, but Bryant, in his "Practice of Surgery," cites a case which he believes to have been one; but some of the cases quoted of spontaneous disappearance are ones actually cured by inflammation which has been set up by some accidental violence, or by inflammation extending from the urethra to the testicle, and thence to the tunica vaginalis. One case of spontaneous disappearance cured by inflammation resulting from external violence is quoted by Sir A. Cooper at page 257 in his work on "The Structure and Diseases of the Testis." The external application of iodine, blistering fluid, and mercurial inunction, have occasionally proved successful remedies in recent cases, but so rarely, and with, in addition, so much discomfort and pain, that it is but seldom resorted to.

Acupuncture is eminently successful, especially in young children; the hydrocele is punctured in two or three places with a broad needle, the flat of the needle being turned at right angles to the puncture before being withdrawn, allowing the hydrocelic fluid to percolate into the cellular tissue external to the tunica vaginalis, substituting "an anasarca of the scrotum for a dropsy of the tunica vaginalis," the fluid being subsequently removed by absorption.

The cure results from the same cause as that by tapping, the withdrawal of the fluid allowing the tunica vaginalis to recover its lost balance between secretion and absorption. To say that the cure of the disease in these cases is effected by the support and compression afforded to the vaginal sac by the infiltration of the surrounding cellular tissue is, I believe, a mistake, as I have never yet known a hydrocele cured by compression.

Acupuncture is a mode of treatment which is simulated in nature by the accidental rupture of the tunica vaginalis and escape of the hydrocelic fluid into the surrounding cellular tissue, for when a hydrocele is of large size jumping from a height or a blow or bruise will readily burst it. This is followed by œdema of the penis and scrotum, and affords a striking analogy to what

takes place when in the injection of iodine some of the injection is inadvertently thrown into the surrounding cellular tissue external to the tunica vaginalis. Such an accident as the latter may be due to the gradual instead of the sudden thrust of the trocar into the distended sac, the parietal portion being thereby separated from the scrotal tissues, a result which may also take place from an imperfectly fitting trocar and canula.

The result which follows such an injection of iodine into the cellular tissue is, I believe, exemplified in the case quoted by M. Gendrin at page 143 of his work on "Inflammations," where gangrene resulted in consequence. Simple tapping will sometimes effect a cure; at other times, however, the fluid will re-collect, but after repeated tappings at increasing intervals an ultimate cure is established. It is said that this mode of treatment is most successful in former inhabitants of the West Indies, but it is not at all uncommon to find examples amongst others; in old people it is as well to temporise with tapping, as they are seldom able to stand more severe measures.

The position of the testicle having been first made out by the transmission of light or by manipulation, a well-fitting trocar and canula slightly oiled, with the finger placed about one

inch from the point to prevent its being pushed onward too far and wounding the testicle, is quickly thrust, avoiding any superficial vein which may be perceptible, anteriorly through

Fig. 11.

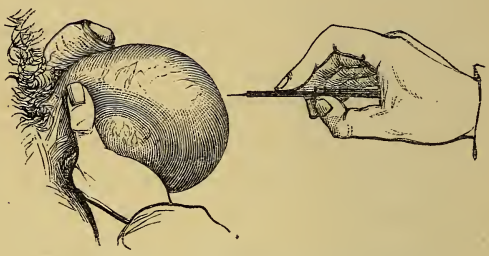


Diagram representing mode of puncture.

the scrotal coverings, which are rendered tense by being grasped firmly by the left hand; as the trocar is extracted the canula is pushed further home and the fluid withdrawn. Should any thickening of the testicle remain after the withdrawal of the fluid, the application of strapping should be employed.

After the withdrawal of the canula no application to the puncture is required, as the collapsed tunica vaginalis will fall as a valve over the opening, and if the scrotum has not been over-distended for some time, so that the muscular tissues be paralysed, the contraction of the dartos will also assist in its closure.

In tapping, then, the following things have to be avoided—wounding the testicle, puncturing any superficial vein, injuring the spermatic vessels situated posteriorly, and separating the parietal layer of the tunica vaginalis from the scrotal tissues by slow puncture.

In some cases the intervals between successive tappings becoming shorter, a more severe mode of procedure has to be resorted to, to effect a cure, and then tapping may be performed with supplemental means, such as irritating the internal surface of the tunica vaginalis by scratching it with the end of the canula, or by passing up the canula a probe coated with nitrate of silver and applying this to the surface of the tunica vaginalis, the latter being the better operation of the two and frequently productive of the best result.

A somewhat similar plan has been tried by Italian surgeons in the application after tapping of the negative pole of a battery to the inner surface of the tunica vaginalis, the positive pole being applied to the external surface of the scrotum.

Injections may also be used in connexion with tapping, of what description is a matter of taste, any irritating fluid which is of sufficient strength to set up some inflammation of the tunica vaginalis answering the purpose. Cold water,

milk, port wine, spirits of wine, a solution of alum or sulphate of zinc (3 grs. to ʒj), or tincture of iodine, have all been used with different results, port wine in the hands of some surgeons having succeeded where iodine has failed. The last-named remedy is the most popular since the excellent results obtained by Sir R. Martin in Calcutta. However, to place this treatment under the head of radical, and to leave out milder remedies, is to say that milder means are never radically curable, and that this mode of treatment never fails, both of which statements are incorrect.

I find on examining the records of old cases of hydrocele treated by injection of iodine that out of fifty-four cases nineteen had been previous iodine failures. Of these fifty-four treated by tapping and injection I have made inquiry, but from twenty-five only I have been able to get replies, and I find that of the twenty-five only seven have had no recurrence, whereas eighteen have recurred. It is further noticeable that of these eighteen two had failed once before.

Of iodine injected some prefer a solution, others ʒij of the pure tincture; whichever is used does not apparently much matter, the chief point being the manipulation of the sac so that

the injection may be brought thoroughly in contact with the whole of the internal lining of the tunica vaginalis.

The amount of pain consequent upon the injection cannot be taken as a criterion as to the ultimate result, for facts show that not infrequently the best results are obtained in cases of the least suffering.

The operation should only be performed at the patient's own house or where no exertion has to be taken subsequently, as occasionally severe inflammation has been set up in consequence.

The subsequent treatment is also one of great importance, the patient being confined to his bed for three or four days, and the testicle supported and ice applied if pain or inflammation be excessive.

Another point of importance should be remembered, and that is that a platinum canula be used, as the ordinary silver canula is destroyed by the action of the iodine.

If port wine be chosen, about six or eight ounces pure are injected and manipulation used as in other cases, and after having been allowed to remain in from ten to fifteen minutes withdrawn. In injecting such a large quantity there may enter not infrequently a certain amount of

air which gives the characteristic crackling sensation of emphysema, but this result is, however, of no great importance, and the air is soon absorbed.

The injection of a mixture of equal parts of carbolic acid and glycerine has been tried by Dr. Lewis, of Philadelphia, who considers it more certain in its action and less painful than iodine.

Under the head of secondary consequences, besides emphysema previously mentioned, there are refilling of the sac, orchitis, and gangrene.

Besides the refilling of the sac and failure of the treatment, there is another form of refilling not unfrequently met with, which is subsequently followed by reabsorption and ultimate cure, consequent upon the pouring out of inflammatory products; therefore in cases where a refilling of the sac takes place it behoves one to speak with caution as to the ultimate result.

Orchitis following injection is due to a primary epididymitis extending to the body of the testicle, in the same manner and for the same reasons as was previously mentioned in the extension of disease from the epididymis to the visceral layer of the tunica vaginalis.

Gangrene seldom occurs if the operation be performed in a proper manner and upon fit sub-

jects, as the result of the injection of iodine into the cellular tissue between the tunica vaginalis and scrotal tissues I have previously mentioned, and in aged persons it is advisable in all cases to temporise with tapping alone.

Tetanus has also occurred, of which Mr. Curling gives several examples; it is, however, so rare an occurrence that it hardly enters into the category of probabilities.

As to the treatment by setons, I would refer to the remarks made by Mr. Green on this subject at p. 73 in the old series of "St. Thomas's Hospital Reports;" the success of the cases there cited speaks in favour of this mode of treatment when held to be necessary.

The seton has been used in two ways, either by allowing it to come away by ulceration and consequently laying open the tunica vaginalis, or only leaving it in a sufficient length of time for inflammation to be produced; the latter is the usual mode—viz., after the hydrocele has been tapped at the lower part by a trocar and canula and the fluid withdrawn, a long needle coated with wax, to prevent injuring the testicle and armed with the seton, is passed up the canula to the upper part of the sac; the needle is then made to perforate the scrotal tissues; the two ends of the seton being subsequently knotted

together on the withdrawal of the canula. This seton is left in from thirteen to thirty-five hours, or rather should not be withdrawn "until some indication of febrile action in the system has been experienced."

The severe symptoms during treatment by the seton were apparently due to the retention of inflammatory materials by the seton itself, as pus in all cases followed its withdrawal, an objection which would be materially obviated by the substitution of a drainage tube for the threads of the seton, as thereby the interior of the tunica vaginalis could be thoroughly washed out by syringing, and retention of inflammatory products rendered inevitable.

A mode of treatment consisting in a combination of the two last methods, viz., by a seton saturated with iodine, has been found successful in some cases, but always with considerable pain to the patient; but a more desirable mode of treatment, and one which I strongly advocate, is the use of a drain formed of thick catgut, the external portions of which separate in about ten days, and the internal portion becomes absorbed.

Excluding accidental rupture, which is virtually an operative procedure, a natural cure has rarely taken place, but of such, from excessive distension, Sir Astley Cooper gives an example

at p. 256 in these words:—"A slough of the scrotum and tunica vaginalis is produced, and as it separates the water escapes, a suppurative inflammation succeeds, granulations arise, and in this way the hydrocele becomes spontaneously cured;" this is, however, too severe a proceeding to justify any surgeon in allowing things to proceed so far; it is, however, a process which has been simulated in the treatment by caustics, the continued application of which to the scrotum has produced a slough through to the tunica vaginalis, on the separation of which the serum escapes and the hydrocele is finally cured by adhesion or granulation.

The frequent application of the caustic, the painfulness of the operation, and the severe effects set up in consequence, would hinder any surgeon of the present day performing, or any patient submitting to, so severe a procedure; more especially will the same remark apply to the two following methods, which are more severe —viz., incision and excision.

Incision, which is chiefly applicable to those cases where the presence of loose cartilaginous bodies are the exciting cause of the hydrocele, or when any doubt exists as to whether it be a hernia or hydrocele, and when used as an aid to diagnosis previous to performing castration,

is best performed by an incision, limited in extent. The old method, the chief advocate of which was Mr. Bell, is performed in the following manner:—The external integuments are divided by one continued incision from the upper to the lower end of the tumour; an opening at the upper end of the incision is made into the vaginal coat large enough to admit the finger, which is passed down as a director for the bistoury and the tunica vaginalis laid open to a corresponding extent with the primary incision. The tumour being opened from above, the hydrocele does not collapse and consequently lessens the risk of injuring the testicle, the cavity of the tunica vaginalis being subsequently dressed with (carbolised) oiled lint, in a similar way as in the treatment of bursæ, thus allowing it to heal up by granulation, a mode of treatment which not unfrequently terminated fatally. Professor Volkman has since modified the seriousness of this operation by performing it antiseptically, and has had some good results, so also have those surgeons who have performed the operation in the same way in England; therefore, when incision is held to be necessary, the antiseptic method should be adopted.

Excision consists in the removal of more or

less of the parietal layer or both layers of the tunica vaginalis after it has been gradually cut down upon; but this operation requires to be mentioned only to be deprecated, and is only resorted to when less severe measures fail, which is but seldom.

Treatment by Carbolic Acid

Inject one drachm of dissolved crystals of pure carbolic acid, and distribute over the sac by gentle shaking. Leave the injection in the sac.

Grease the scrotum well to prevent the caustic action of the acid if it drops on the scrotal surface

CHAPTER IV.

HYDROCELE OF THE VAGINAL PROCESS.

HYDROCELE of the vaginal process of peritoneum is a collection of fluid in the vaginal process due to the non-closure, or closure with subsequent reopening, of the funicular portion of the vaginal process, and consequently a communication exists with the peritoneal cavity (see Fig. 3). The complete failure of adhesion between the two surfaces of the funicular portion of the vaginal process is probably the more frequent cause; but that some slight adhesion had taken place, and was subsequently ruptured by the cries of the child, is also possible in many instances.

On account of this failure in the natural process which should cut off the communication between the peritoneal sac and the vaginal sac, this variety of hydrocele has received the name of "congenital hydrocele of the testis." The tube of communication is not usually of large size, being about the size of a crow or goose quill. A communication between the vaginal

sac and the peritoneal sac in adults is not uncommon, as it will be remembered that in the body of Sir Astley Cooper there was found on both sides a communication large enough to admit a probe, and there occur transitions from this slight condition to that of complete patulence combined with hernia. Congenital hydrocele as well as congenital hernia is therefore to be found in adults as well as in children, and, as in hernia, may be hereditary from a preternatural weakness of the abdominal wall, and a consequent failure of adhesive power.

The fluid contained in a hydrocele of the vaginal process is, I believe, fluid from the peritoneum, which has percolated downwards through the more or less open canal, and is not secreted from the vaginal sac itself.

In support of this theory is—1st, the occasional presence of this form of hydrocele with dropsy, and the capability of emptying the abdomen by tapping the hydrocele, which, by its communication, is the most dependent part of the peritoneum; 2nd, the cure of hydrocele of the vaginal process by the continuous application of a truss; and 3rd, the larger size towards evening, after the patient has been in the perpendicular position, thus allowing of the gravitation of the fluid downwards.

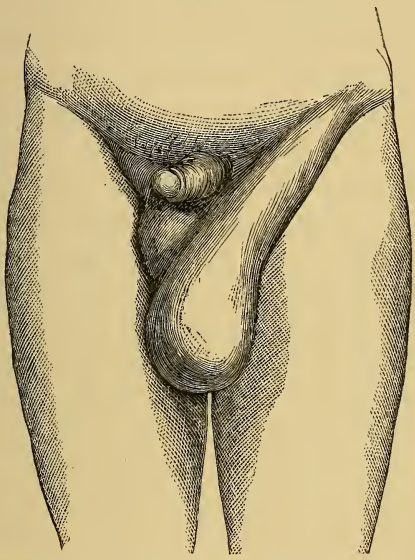
This variety is most frequently met with in infants, and, differing from vaginal hydrocele, is most frequently met with on the right side, probably due to the right testis being the last to descend into the scrotum. A modification of hydrocele of the vaginal process is met with, where the collection of fluid is in the vaginal sac communicating with the peritoneal sac, but the testicle is either retained in the abdomen or in the inguinal canal—the retained testis being the cause of the failure of adhesion.

In addition to the symptoms associable with all forms of hydrocele—viz., transparency, fluctuation, &c., the following are characteristic of this variety. It is essentially the hydrocele of infants, although occasionally met with in adults.

If the opening communicating with the peritoneum be large, the conical appearance of the swelling is very characteristic, as the corresponding half of the scrotum is pointed at its lower part, and, being also pushed slightly forwards, it is somewhat concave anteriorly. The same appearance is presented in cases of congenital hernia. And it is in these cases of a large opening that protrusion of intestine is found also, and perhaps it is only after the application of a truss, which returns the intestine, that the hydrocele is diagnosed. On assuming the erect

posture after the application of the truss, the fluid of the hydrocele becomes visible, as the truss retains the intestinal contents, but not the hydrocelic fluid. When the opening is small the shape will vary from oval to one more or less

FIG. 12.



Representing a hydrocele of the whole vaginal process of peritoneum.

pear-shaped, the central constriction, or occasional hour-glass shape, being due to the contraction which normally takes place above the testicle in the obliteration of the funicular portion of the

vaginal process of peritoneum. On account of the communication with the peritoneum, an impulse is imparted to the fluid on the patient crying or coughing. A reduction in size is noticeable upon placing the patient in a recumbent posture, and an increase in size is noticeable towards evening after the erect posture has been maintained during the day, variation in size being due to the gravitation of the hydrocelic fluid, and the rate of disappearance corresponds with the size of the opening into the peritoneum, which in some cases may be too small to allow of any appreciable return of the fluid into the abdominal cavity. Diagnosis between this form of hydrocele and hydrocele of the tunica vaginalis is in such cases impossible; but when the tube of communication is so fine as to be unrecognisable, it may be left out of the question, as the inflammation set up by the line of treatment adopted will occlude the communication, which is too narrow to allow the extension of any severe inflammation. Caution is, however, necessary, for should the communication be larger than supposed, the inflammation may extend into the peritoneum, peritonitis ensue, and the case terminate fatally.

Probably more cases of hydrocele occurring amongst infants are of this variety than is supposed,

for should the communication be small, the fluid may easily accumulate drop by drop, and yet be irreducible in sufficient quantity to be recognised. However, the two main points of diagnosis between the two varieties (hydrocele of the vaginal process of peritoneum and hydrocele of the tunica vaginalis), are the prolongation upwards of the swelling along the inguinal canal, and the disappearance of the swelling on lying down. Congenital hernia is the only disease there is any likelihood of its being confounded with, and, as previously mentioned, the two are frequently associated; if transparency be present, or if the contents of the scrotum be returnable into the abdomen without a gurgling sensation, and return to the scrotum whilst the external abdominal ring is perfectly closed by the finger, it shows the contents to be fluid, or, in other words, a hydrocele of the vaginal process of peritoneum. Between hydrocele of the vaginal process of peritoneum, and funicular hydrocele which communicates with the peritoneum, the diagnosis is made by the testicle being involved in the swelling of the former, but in the latter is found to be quite distinct below the fluid.

To effect a cure it is necessary to permanently close the opening communicating with the peri-

toneum, for it is the passage of the fluid backwards and forwards which prevents the canal closing, therefore if this be prevented either by the communication being compressed or the scrotum suspended, a cure will result.

Active treatment is prevented by the presence of the communication with the peritoneum, the obliteration of which is the first object in the treatment, and its attainment usually results in the cure of the complaint. This is obtained by continued pressure upon the unobliterated vaginal process by the constant use of a truss, and should the hydrocele not disappear on the obliteration of the tube of communication, tapping or other supplemental means may be employed. The use of stimulating injections when the communication is not large, is justifiable and frequently results in a cure, the tube of communication being closed by a truss during the course of the treatment. Great caution must be used, as stated previously, or peritonitis may set in, and the case terminate fatally.

CHAPTER V.

HYDROCELE OF THE FUNICULAR PROCESS.

Hydrocele of the funicular portion of the vaginal process of peritoneum may be either congenital or acquired. In the first, the closure of the vaginal process takes place above the testis, but not at the upper inguinal opening, consequently a collection of fluid takes place in the funicular portion of the vaginal process, which is shut off below from the vaginal sac, but which above communicates with the peritoneal sac. (See Fig. 4.) This variety has been called congenital hydrocele of the cord, but the objection to this name is that it is not necessarily congenital, as in the second form of the same variety it will be explained that by the pressure of the fluid which is secreted by the hydrocele, the areolar tissue which closed the upper opening can become broken down. The second form is where the adhesion takes place above the testis, and also at the upper inguinal opening, but between these two points adhesion does not take place, con-

sequently an interval is left. (See Fig. 7, A, B.) Sometimes more, sometimes less, of the funicular process becomes dilated with hydrocelic fluid, and it has been customary to call it diffused hydrocele when large, encysted hydrocele when small; an unnecessary distinction, as the term encysted, if used at all, is better confined to those varieties occurring outside the vaginal process.

A hydrocele of the cord which has partially opened up the funicular process, represents a globular swelling, with a tube-like prolongation at the upper part. This has received the name of water-bottle hydrocele of the cord. (See Fig. 5, B.) This may be due, when the neck is narrow, to the funicular process of peritoneum never having properly closed, but when the neck of this bottle-shaped hydrocele is wide, which it is more frequently, then it is due to the pressure of the fluid secreted by the hydrocele opening up the areolar tissue, which feebly unites the two surfaces of the formerly open funicular process of peritoneum. The continuance of this distending process leads to the final communication of the hydrocele with the peritoneal sac, and is identical with what has been described as congenital hydrocele of the cord, or more properly, hydrocele of the whole of the funicular portion of the vaginal process of peritoneum. Hydrocele

of the funicular portion of the vaginal process, communicating with the peritoneal cavity, may be then either congenital or acquired. The symptoms of both being identical, the description of one will suffice for the other. In addition to being most frequently met with in early life, it is never of large size. The form is more or less pear-shaped, with the broader portion downwards, but clearly above the testicle, which is perfectly free and healthy. If the communication with the peritoneum be large, a decrease in size is perceptible when the patient is recumbent, and on manipulation the amount of fluid may be still further lessened in quantity. Fluctuation and transparency are also present, but the latter is sometimes difficult to obtain on account of the swelling being situated high up in the scrotum. There is an entire absence of pain, and it produces but little discomfort.

It is diagnosed from hernia by the different mode of return into the abdomen, which it does slowly, and without the characteristic gurgling sensation, the fluid collecting again in the scrotum, although the finger be placed in the internal abdominal ring. There is, however, in both an impulse communicated on coughing. In hernia, translucency and fluctuation are not present, and the surface of the swelling on manipulation

feels uneven, and has in addition the characteristic sign of greater breadth above than below, the reverse being the case in hydrocele. From hydrocele of the funicular portion of the vaginal process that does not communicate with the peritoneum or from encysted hydroceles, the diagnosis is made by the swelling not disappearing on pressure, and by the more or less defined boundary to the swelling at the upper part, a clear space being frequently perceptible between the tumour and the abdomen.

The difficulty in the line of treatment consists, as in hydrocele of the vaginal process, in there being a communication with the peritoneum, and only when large in size should any interference be undertaken, for the treatment is too hazardous to justify its application to a disease which is of so little discomfort. In children it will sometimes disappear without treatment, or after the application of evaporating lotions. The application of a truss and its constant use is the best line of treatment either alone or with the subsequent evacuation of the fluid by tapping.

In hydrocele of the funicular portion of the vaginal process which does not communicate with the peritoneal cavity, the cause is congenital but the disease acquired. For obliteration having commenced at the two usual points—viz.,

above the testicle and at the upper inguinal opening, the process has failed to be completed along the whole length of the funicular process. A space results, in which fluid subsequently collecting, a hydrocele is formed.

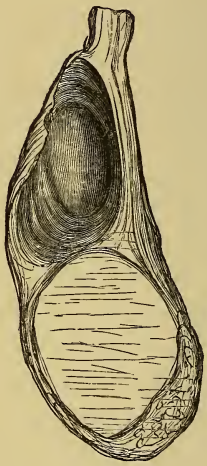
The shape varies from round and bottle-shaped to one more or less oval, the form depending upon the obliteration that had taken place and the amount of fluid secreted.

Diagnosis by translucency is not easily obtained, but with the patient in the position for lithotomy this is much facilitated. This variety simulates hernia very closely, especially in those cases where the whole of the swelling is slowly returnable into the abdomen, but on account of the upper opening of the funicular portion being still closed, the distended sac is still to be detected within the abdominal walls. In both an impulse is imparted on coughing, but in hydrocele less than that in hernia, the impulse in the latter being one more of expansion than projection.

An enlarged gland or an encysted hydrocele may resemble this form of hydrocele. The former is usually situated higher up in the groin, is not transparent, does not fluctuate, and frequently there are more than one. An encysted hydrocele is usually rounder, not so large in size, and situated more posteriorly, for any dilatation of

the vaginal process of peritoneum must necessarily be situated anteriorly. Difficult cases for diagnosis, however, occasionally occur, but fortunately the line of treatment for both is identical. The diagnosis between a hydrocele of the lower part

Fig. 13.



Showing partial hydrocele of the tunica vaginalis. St. Thomas's Hospital Museum. Prep. E. E. 64.

of the funicular process and a partial hydrocele of the upper part of the tunica vaginalis is one of extreme difficulty, if not impossible.

Fig. 13, where the opposed surfaces of the tunica vaginalis were closely adherent everywhere except

at the upper part, represents such a case. When small they do not necessitate any interference, but if increasing in size, treatment by tapping or acupuncture may be resorted to without fear. And should the swelling return, which it not unfrequently does, the same operation may be repeated with or without the injection of iodine, but to perform incision or other more severe remedies is, I consider, unjustifiable, as its presence is of little inconvenience to the patient.

CHAPTER VI.

ENCYSTED HYDROCELES.

The previous varieties of hydrocele spoken of are due to imperfections in the proper development or closure of the processus vaginalis. The term encysted hydrocele I propose confining to cysts occurring in connexion with the testis or cord, but distinct from the processus vaginalis in not being dilatations of the same.

Encysted hydrocele may be due to morbid affections of fœtal remains—viz., dilatations of the corpus Morgagni, or any other portion of the Müllerian duct; of the organs of Giraldès; or may be due to dilatation of spaces in connective tissue.

The hydatid of Morgagni is the name given to a small oval body situated between the globus major of the epididymis and the body of the testicle; attention was first called to it by John Baptist Morgagni in his work on "The Seats and Causes of Disease," published at Venice in 1761, and after whom it is called. The name by which it is familiar to us is to be regretted; the

term hydatid is associated with an animal parasite and never used in any other acceptation; such, however, was not what Morgagni intended to signify, but merely a vesicle, the same expression of hydatid, meaning a vesicle, being used in Italy and Germany up to the present day; the term hydatid, meaning a parasite, being but of late introduction into medical literature. Morgagni being the first to draw attention to this body, it is interesting to state his opinions, more especially as they will bear on remarks which will have to follow. The subjoined extracts are from post-mortem records in his work mentioned above.

In Letter 4, Article 30, he states that—

"Within each tunica vaginalis an hydatid existed which was almost detached; and the fluid with which these vesicles were distended did not coagulate by heat, but after evaporation a thin pellicle was left in the vessel."

In Letter 43, Article 17:

"The left side of the scrotum was tumid. Beneath the thickened tunica erythroides (cremaster muscle) and tunica vaginalis, and within the enlarged cavity of the latter coat, I found a serous fluid of a yellowish-brown colour. The testis appeared elongated rather than thickened, and the epididymis was unquestionably longer than it naturally is. I observed a small fimbriated substance hanging from the albuginea, where it invested the testicle very near the larger globe of the epididymis; and this fimbria I considered the relic of a ruptured hydatid, especially as not far from it an entire hydatid protruded from the same coat."

Again in Articles 18 and 19 of the same letter :

"Between the tunica vaginalis and albuginea on that side I found a small quantity of serous fluid, the colour of urine.

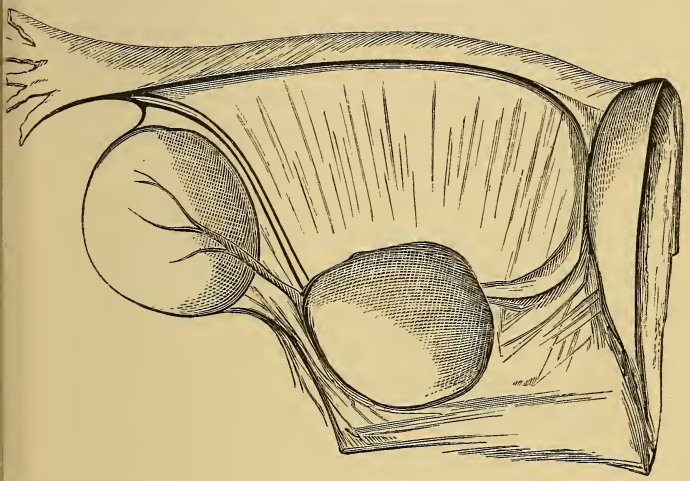
"The albuginea was rugged from very small tubercles, and in consequence of observing some hydatids in the same coat which had not quite burst, I was led to suppose that the tubercles were the remains of hydatids.

"The same tunic contained a fluid resembling water in which fresh meat has been washed; and from the larger globe of the epididymis a small hydatid hung by a slender and short peduncle, and a small bloodvessel could be perceived passing through it."

Such is the description given by Morgagni, and from this it is evident that his view of the nature of this body was practically correct,—that true hydatids or parasites have occurred in the testicle is proved by a case brought under the notice of Sir Astley Cooper by a student of St. Thomas's Hospital, and of which he speaks at p. 152, in his work on the "Structure and Diseases of the Testis." Small bodies or vesicles similar to this hydatid of Morgagni, in being the remnants of fœtal structures and in also being occasionally the seat of disease, are met with in females, situated in the broad ligament between the ovary and fimbriated end of the Fallopian tube, and classified under the heading of extra ovarian tumours. The subjoined diagram is an excellent example of dilatation of this vesicle in the

female. Another diagram of such a condition is given at p. 30, in Mr. Spencer Wells's work on "Diseases of the Ovaries," in which also he describes one as attaining the size of twice that of an adult head.

Fig. 14.



Specimen showing cyst between left Fallopian tube and ovary. St. Thomas's Hospital Museum: Prep. F. F. 1.

However, it is now known that this body which Morgagni believed to be a new formation is the remains of a fœtal structure, and for which information we are indebted to J. Müller, who, in 1835, published some remarks upon the development of the genital organs, in which he

demonstrated the existence of a canal, which has since been called after him the Müllerian duct, the upper part of which forms the vesicle known as the hydatid of Morgagni.

Concerning the use of this Müllerian duct we know little. In the male, as far as we are at present aware, it is of little importance, whereas in the female it undergoes a process of higher development, forming ultimately the Fallopian tube with its fimbriated extremity, and also part of the body of the uterus.

That it is a channel with an external opening, terminating in the male at the sinus pocularis, and in the female in the uterus, leads one to suppose that as the Wolffian duct is the excretory channel for the Wolffian body or primitive kidney, so may the Müllerian duct be the excretory channel for the ovary or testis. As regards the ovary, such we find to be the case, the channel becoming dilated into the Fallopian tube: in the testis, however, it is of secondary importance as compared with the canal of the vas deferens; a permanent communication may, however, remain, thus accounting for the presence of spermatozoa in cases of encysted hydroceles.

That it also consists partly of the remains of vessels is also true, but not entirely, as will be seen when its minute structure is considered.

The course of the Müllerian duct, represented at its upper part by the corpus Morgagni, and terminating at its other end in the sinus pocularis, becomes difficult of demonstration between these points. But in some cases it can be partially traced, and runs from the globus major between the epididymis and the testicle in the digital fossa downwards towards the globus minor; beyond this it is impossible to trace it, but for a certainty the obliterated remains of the Müllerian duct should be enumerated amongst the other things entering into the formation of the spermatic cord.

The corpus or hydatid of Morgagni is a constant structure, and no accidental cyst, as some authors describe. Its seat is between the summit of the globus major and the body of the testicle, between the visceral layer of the tunica vaginalis and the tunica albuginea, and is attached to the testicle by a peduncle more or less large, sometimes measuring as much as three-quarters of an inch in length. (See Prep. E. E. 58, St. Thomas's Museum.) This peduncle may rupture, and the vesicle becoming detached form the exciting cause of the most common form of hydrocele—viz., that of collections in the tunica vaginalis. Of this Morgagni was aware, but he erred on the other side in attributing all cases of hydrocele to

this origin, as will be seen from this extract from Letter 43, Article 16:

"Indeed, when I attentively review all my observations in reference to hydrocele, I find none which does not appear to have originated from ruptured hydatids. In each of them some hydatids were still remaining either in a perfect state or half-lacerated, or some traces of them were visible. Hydatids are sometimes found within the tunica vaginalis even when no effusion has commenced; but if they burst and afterwards continue to secrete fluid, undoubtedly they must produce hydrocele."

Two or more vesicles are occasionally present, their situation being in connexion with the globus major of the epididymis, and at page 186 in Curling's work on the "Diseases of the Testis," such a condition is well represented. Multiplicity of vesicles is found with greatest frequency on the left side; in one out of every ten left testes under examination multiple vesicles are generally found. Why such should be the case is unknown without the increased length of the left testis producing venous congestion tends also to produce excessive transudation of serum, for the same reason that hydrocele of the tunica vaginalis is more frequent on that side also; varicocele also being most frequent on the left side from the same cause.

Concerning the structure and contents of the corpus Morgagni, it will be found to consist externally of the visceral layer of the tunica

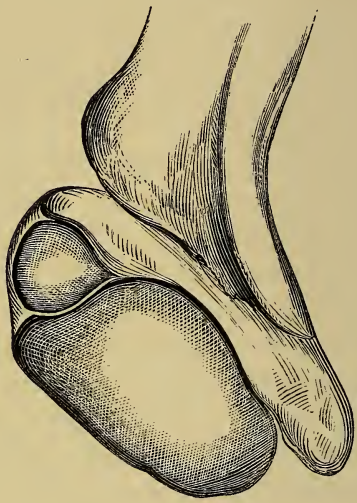
vaginalis covering the proper fibrous cyst which has an internal lining of tesselated epithelium, contained within which is some molecular matter, whilst between the tunica vaginalis and the cyst-wall are numerous fine bloodvessels.

Having now described the anatomy and the structure of the corpus Morgagni, and its course as continued on into the Müllerian duct, the practical application of it to encysted hydrocele remains to be considered.

Fluid collections in the corpus Morgagni may be of so small a quantity as not to be discernible during life, and therefore give rise to no inconvenience, and only attract attention after death. Larger collections of fluid in the same body form the ordinary encysted hydrocele of the testis, and of this specimens may be seen in all stages of gradation. A drawing of a large encysted hydrocele, representing E. E. 69 in the Museum of St. Thomas's Hospital, is figured at Pl. XI., fig. 3, Part II., in Sir A. Cooper's work on the testis, and the subjoined diagram, Fig. 15, is that of a smaller variety. In both of these, at the edge of the section, the membrane of the cyst can be seen to be quite separate from the tunica vaginalis which covers it, and the cyst is situated between the visceral layer of the tunica vaginalis and the tunica albuginea.

In structure an encysted hydrocele of the testis consists of a cell-wall composed of fibrous tissue with an internal lining of tesselated epithelium, contained within which is a perfectly limpid and colourless fluid containing no albu-

Fig. 15.



Specimen showing encysted hydrocele in position of corpus Morgagni of left side.
Prep. E. E. 70, St. Thomas's Hospital Museum.

men, and therefore not coagulable by heat, thereby differing from that contained in the ordinary vaginal hydrocele; it is at times milky in character, and occasionally tinged with blood; the opalescent appearance is due to spermatozoa

and seminal corpuscles, the origin of which must be considered hereafter; the presence of blood within the cyst also remains to be considered. From this description it will be seen that in structure, as well as in its seat of origin, an encysted hydrocele resembles the corpus Morgagni.

That some encysted hydroceles of the testis or cord are probably collections of fluid in the unobliterated Müllerian duct, and quite unconnected with the processus vaginalis of the peritoneum, is evident by the occasional presence of a cyst between the testicle and epididymis, or even at parts of the cord altogether behind the obliterated tunica vaginalis, and in the contents of the cyst being non-albuminous, with the occasional presence of spermatozoa.

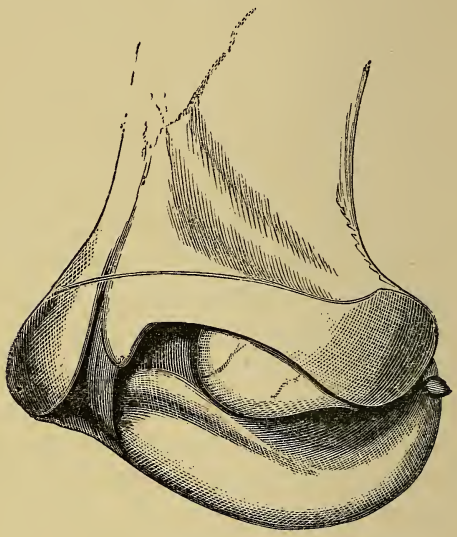
The following diagram, Fig. 16, shows the presence of an encysted hydrocele in the digital fossa corresponding to the track of the obliterated Müllerian duct.

The internal wall of one of these cysts may become uneven and nodulated from the deposition of calcareous matter, which, increasing gradually, will eventually end in those calcareous nodules met with in connexion with the testicle or cord.

With reference to the presence of spermatozoa in these cysts as first discovered by Mr. Liston

about 1843, two opinions are held by different authors. Curling and others believe their presence to be due to rupture of spermatic tubules passing in proximity to the cyst wall in exactly

Fig. 16.



Specimen showing encysted hydrocele between epididymis and body of right testicle.
Prep. XIII. 26, St. George's Hospital Museum.

the same manner as encysted hæmatoceles are formed; whereas Luschka and others, who have demonstrated the existence of a duct connecting the cyst with the spermatic tubes, believe that

the passage of the spermatozoa into the cyst takes place by this means, probably by that canal which was in the fœtus the communication between the ovary or testis and the Müllerian duct.

Other suggestions have been made to account for the presence of these bodies—viz., that of Paget, in supposing them to be secreted from the internal lining of the cyst-wall itself, and that of Liston in the cyst being a dilatation of one of the seminal tubes; but the two previously stated are the most probable theories.

In vol. v. of "Holmes's Surgery," at p. 97, is represented an admirable diagram of spermatic cysts, fig. *b* showing one situated in the exact position of the corpus Morgagni, and suggestive of being a dilatation of the same.

The organs of Giraldès are small tubes remaining from the fœtal structure known as the Wolffian body. They are usually three or four in number, and are situated in front of the cord, and behind the tunica vaginalis, and slightly above the globus major of the epididymis. Found at birth, they subsequently increase to three or four times their original size, undergoing the same process of development as the other parts in the immediate neighbourhood of which they are but offshoots. Their normal size

and position are shown in fig. 675 of the second volume of Quain's Anatomy, and again in the *Journal de la Physiologie*, 1861. In the latter is found the original article by J. A. Giraldès, after whom these tubes are called, and who also enumerates dilatations of the same as an origin of encysted hydrocele. These tubes are lined with squamous epithelium, and contain a clear, sticky fluid, with granules and sometimes spermatozoa. One of these simple tubular formations augmenting in size, forms a cyst which in the nature of its contents and seat of origin is identical with some encysted hydroceles of the cord.

Encysted hydrocele may be also due to the dilatation and fusion of spaces in connective tissue. Such cases are not common, and pathological specimens are still more rare. In the St. Thomas's Museum is such a case; and the preparation E. E. 71 shows the presence of a cyst four inches in length springing from the cellular tissue of the cord, three-quarters of an inch above the testicle. It was loosely adherent to the anterior part of the tunica vaginalis, and descended two inches below the testicle, which protruded into it. The cyst contained a clear, colourless watery fluid. Whatever be the origin of these encysted hydroceles, and however in-

teresting their pathology may be, the diagnosis and treatment are the chief points of importance.

Diagnosis of encysted hydrocele is usually not difficult. When very small it is not discernible during life, and only discoverable post-mortem; but when the size of a marble or larger, it comes under the notice of the surgeon, not on account of pain, but from its gradual increase in size, or from the supposition of a tumour or third testicle.

In shape it is always round, tense, fluctuating, and transparent, appearing as if budding off from some part of the testicle or cord, and occasionally attached thereto by a slender peduncle.

Being always globular, it is easily distinguishable from the pyriform swelling of vaginal hydrocele; and also in its history shows a much slower process of growth, many years being required for it to attain to anything like the size of a hydrocele of the tunica vaginalis. As it increases in size it tends to involve the testicle; this was markedly seen in Prep. E. E. 71, previously referred to, and the diagnosis becomes correspondingly more difficult. The contents of these cysts are, however, very characteristic; for instead of the pale yellow, more or less albuminous serum, with occasional cholesterine, which is found in all hydroceles of the vaginal process

of peritoneum, the contents consist of a watery fluid, with granules and occasional spermatozoa.

As to the position of the testicle, which in hydrocele of the tunica vaginalis is always found posteriorly, in encysted hydrocele is found usually below or on the inner side, but may be found almost anywhere, and in one case I have seen it situated above the cyst. The greater number of these cysts springing from some part of the epididymis accounts for their occupying a position above and to the outer side of the testicle.

From partial hydrocele of the tunica vaginalis previously spoken of, the diagnosis is made by the character of the contents, and by the history, which, in addition to more rapid growth, relates to some former tapping with supplemental means. As regards treatment, if any be called for, tapping is usually sufficient, as their slow process of growth seldom calls for its repetition; but should such be the case, tapping with supplemental means, such as the injection of iodine, or other modes previously mentioned, may be resorted to.

CHAPTER VII.

COMBINATIONS OF HYDROCELE.

Combinations may occur either of two varieties of hydrocele or of hydrocele and hernia, and the modification of the latter where a hydrocele of a hernial sac exists. The right side is the more frequently liable to these combinations, on account probably of the right testicle being the last to descend into the scrotum. Combinations of two varieties of hydrocele are occasionally met with, the most frequent being where an encysted hydrocele and a hydrocele of the tunica vaginalis occur. It is not at all uncommon to find one or two cysts connected with the globus major of the epididymis, and, as previously mentioned, the hydatid of Morgagni is always present. If the latter be dilated it frequently, owing to the irritation it causes, gives rise to a collection of fluid in the interior of the tunica vaginalis. At an early stage this combination of encysted hydrocele and hydrocele of the tunica vaginalis may be diagnosed, but as the hydrocele of the tunica

vaginalis increases, the two become merged into one another, and the appearances present those of an ordinary hydrocele. On tapping, however, the hydrocele is found not to be completely emptied, and on thrusting the trocar onwards another cyst is opened, the fluid of which is not that pale amber-coloured fluid which came away from the first puncture, but the watery non-albuminous fluid of encysted hydroceles.

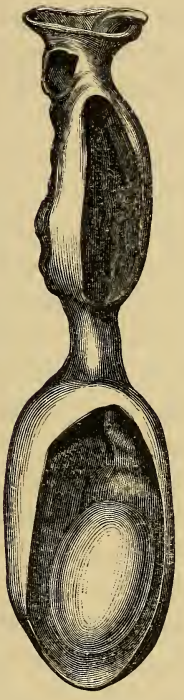
Mr. Curling states that he believes "some of the cases of multilocular hydrocele mentioned by writers, to have been instances of this complication." Should the history give account of a previous tapping conjoined with supplemental means, such as injections, a multilocular hydrocele is more likely; for I believe the multilocular condition to be due to adhesions between the two layers of the tunica vaginalis, as the result of former inflammation, and a subsequent collection of fluid between these adhesions.

The combination of a hydrocele of the funicular portion of the vaginal process of peritoneum with a hydrocele of the tunica vaginalis is more rare. Fig. 16 represents such a condition, and shows also the presence of a small inguinal hernia.

The presence of two swellings on one side of the scrotum, with a distinct furrow between

them, is indicative of such a combination, and resembles the hour-glass shaped hydrocele, and

Fig. 17.



Showing hydrocele of the tunica vaginalis, combined with hydrocele of the funicular portion of the vaginal process and inguinal hernia. St. Thomas's Hospital Museum. Prep. E. E. 73.

which, being the more often met with, is easily

mistaken for it. On tapping, however, the lower cyst will be found to empty itself, the upper remaining more clear and defined. In hour-glass shaped hydroceles a distinct wave of fluctuation will be communicated from cyst to cyst; whereas when separate, fluctuation is confined to each respective cyst, though if the two be in close contact it will be very difficult to diagnose them. The hour-glass shape communicated to a hydrocele is generally due, as previously stated, to the natural contraction which takes place in the vaginal process of peritoneum above the testicle, but this may also occur from such a combination as the above and the communication between the cysts subsequently being broken down by the gradual pressure of the fluid secreted, opening up the areolar tissue which united the two surfaces of the vaginal process of peritoneum.

The upper cyst may involve more or less of the funicular portion of the vaginal process, and according to its size so much the more will the swelling stretch upwards towards the internal abdominal ring.

The combination of a scrotal hernia with hydrocele of the whole vaginal process of peritoneum is not uncommon, and when speaking of this congenital variety, I mentioned that it not unfrequently happened on the reduction of the

rupture to find the hydrocele remain, the latter being only recognisable on the reduction of the former.

Hernia may be combined also with hydrocele of the tunica vaginalis or with hydrocele of the funicular portion of the vaginal process, or with both.

When combined with hydrocele of the tunica vaginalis two distinct swellings usually exist, the one above the other, each with its respective symptoms; but if of long standing, the two are more intimately connected and sometimes blended together, the hydrocele then taking a position anterior to the rupture, the structures of the cord being separated by the passage of the rupture. When the hydrocele is situated posterior to the hernial sac, it is then found to be a dilatation of some portion of the funicular process. Sometimes the rupture projects into the upper part of the hydrocele, and Dupuytren mentions cases where strangulation occurred at that point of the vaginal process above the testicle where contraction normally takes place. It is stated by Mr. Curling that "a voluminous hydrocele if unsupported appears to be highly favourable to the occurrence of hernia by dragging down the peritoneum." This I consider extremely likely, just as in the same manner the shrinking of

glands in the groin of old people also favours hernia.

The combination of hernia with hydrocele of the funicular portion of the vaginal process is rare; but a combination with hydrocele of the tunica vaginalis as well is still more so. Such, however, is represented in Fig. 16, the presence of these several dilatations showing that the uniting medium which should have conjoined the two surfaces of the vaginal process of peritoneum was either absent in part or defective in strength.

Mr. Rivington, in vol. ii. (1865) of London Hospital Reports, relates a case of hernia combined with hydrocele of the funicular portion of the vaginal process, where the hernia projected into the upper part of the hydrocele to such an extent as to simulate externally merely an inguinal hernia, and which by the weight and pressure of the superincumbent intestine so thinned the intervening partition as to produce the impression that it was composed of only one layer of peritoneum. The combination of hydrocele with elephantiasis of the scrotum is not at all an uncommon occurrence in the West Indies, the hypertrophy of the scrotal walls and the effusion into the tunica vaginalis being effected by the same cause—viz., feebleness of circulation.

The history of a very interesting case of hydrocele of the funicular portion of the vaginal process combined with inguinal hernia on the same (right) side, and also with elephantiasis of the scrotum, which occurred in the Bâle Hospital, under the care of M. Socin, has been lately published by M. Léon Chavannes, of Lausanne.

When the hernia and hydrocele are distinct, treatment by any of the means formerly enumerated for the cure of hydrocele may be carried out; but as the two become more blended together, so must the more caution be used as to any interference, it being better to temporise with palliative remedies. Care should be always taken previous to tapping to thoroughly reduce the whole contents of the hernial sac.

Hydrocele of the hernial sac consists in a collection of fluid in an old hernial sac, whether inguinal or femoral, the upper part of the sac being closed by adhesion of its two surfaces, or by the attachment of intestine or omentum at the mouth of the sac. The fluid is secreted by the internal lining of the cyst wall, just as in ordinary hydrocele.

Hydrocele occurring in the sac of an old inguinal hernia is not uncommon, whereas hydrocele in the sac of a fermoral hernia is of extreme rarity.

After a long application of a truss, the hernial sac becomes adherent at the point of pressure, the part below subsequently closing or becoming the seat of dropsical effusion.

Hydrocele of an inguinal sac is not infrequently met with, and might very easily be mistaken for one of the other varieties more frequent in this locality, simulating hydrocele of the funicular process very closely, the testicle in both being uninvolved and free below the swelling.

Hydrocele of a hernial sac gives the ordinary fluctuation of fluid and greater or less transparency. The fluid removed varies in colour from a clear amber to a dark brown, the greater depth of colour being found where intestine is in proximity. Should the upper part of the sac be closed by intestine or omentum, there is found a fulness of the abdominal ring, and not a clearly defined upper margin to the tumour as in ordinary hydrocele. The history of the case and the age of the patient are the chief aids to a successful diagnosis; for hydrocele of the funicular process is usually met with in young persons, whereas hydrocele of the hernial sac is found in adults; and the knowledge of a previous rupture, with a long continued application of a truss, would still further lead one to suspect such a condition.

Hydrocele of a femoral sac is so uncommon that Mr. Langton, in the St. Bartholomew's Reports for 1874, in mentioning such a case, states that it is the first instance which has occurred out of seven thousand cases of femoral hernia applying to the Truss Society in eighteen years.

A true hydrocele of the femoral canal has been occasionally met with. A small protrusion of peritoneum through the femoral ring having become constricted at its neck, a small cyst is formed, containing fluid identical in origin and consistence with the fluid contained in hydrocele of the inguinal canal. Prep. R. 75 in St. Thomas's Hospital Museum represents, I believe, such a case. The long axis of the cyst, which measured three and a quarter inches in its long, and two inches in its transverse, diameter, was directed downwards and inwards. The parietes of the cyst was puckered at its point of egress from the femoral canal, and its lining membrane covered with adherent lymph.

When the hydrocele is the dilatation of a hernial sac, closed at the neck by the adhesion of its surfaces from the pressure of a truss, the ordinary treatment of hydrocele may be resorted to; but should the upper part be closed by intestine or omentum, as diagnosed by the fulness at the

neck of the sac, greater caution should be used. If, however, it be ascertained that there exist no communication between the peritoneal lining of the cyst and the peritoneum proper, all fear of transmitting inflammation to the latter is out of the question, and more heroic measures may be adopted, that by incision being the safest and surest.

Occasionally strangulation of a portion of intestine has occurred in the gut situated at the upper part of the sac, the operation for the relief of which has cured the two diseases, the operation for the hydrocele being that by incision.

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